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ABSTRACT

This study addressed the question: "What instructional techniques are most effective in helping students learn how to self-regulate their learning?" An integrated model based on current research in self-regulated learning (SRL) was used to explain changes in students' SRL. Five key instructional practices were identified and embedded into a math curriculum: (1) guide self-beliefs, goal setting, and expectations; (2) promote reflective dialogue; (3) provide corrective feedback; (4) connect abstract concepts; and (5) link to new experiences. Data were collected from 78 students attending a New England community college. Analysis of variance, correlations, and path analyses were used to determine differences between the treatment and comparison groups' perceptions of their SRL pre- to post-semester. The results suggest that students who learned through SRL-embedded teaching methods became more effective in SRL, a finding that emphasizes the critical role that instructors play in the SRL process by providing cues within the instructional setting. The results also indicate that SRL is an integrated process. The paper suggests that future research in SRL should focus on methods that capture the interrelationship among the SRL variables. (Contains 49 references.) (Author/SM)

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Changes in Students' Self-Regulation Based on Different Teaching Methodologies

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Changes in Students' Self-Regulation Based on Different Teaching Methodologies

Abstract

This study addressed the question: What instructional techniques are most effective in helping students to learn how to self-regulate their learning? An integrated model based on current research in self-regulated learning (SRL) was used to explain changes in students' SRL. Five key instructional practices were identified and embedded into a math curriculum: 1) guide self-beliefs, goal setting, and expectations; 2) promote reflective dialogue; 3) provide corrective feedback, 4) connect abstract concepts; and 5) link to new experiences.

Data were collected from students (n = 78) attending a New England community college. Analysis of variance (ANOVA), correlations, and path analyses were used to determine differences between the treatment and comparison groups' perceptions of their SRL pre- to post-semester.

The results suggest that students who learned through SRL embedded teaching methods became more effective in SRL, emphasizing that instructors play a critical role in the SRL process by providing cues within the instructional setting. Higher education can help students become prepared for employment by integrating the teaching of self-regulation skills into the curriculum. The results also indicated that SRL is an integrated process. Future research in SRL needs to focus on methods that can capture the inter-relationships among the SRL variables.

Changes in Students' Self-Regulation Based on Different Teaching Methodologies

Most experienced teachers share Zimmerman's (1994) observation that some students know how to learn but many do not. The problem of whether or not students know how to learn is compounded when considered along with the rhetorical question Janssen (1996) poses: "What should students know about how to learn?" In response, he argues that college students should know how to (a) master a body of knowledge within a well-defined discipline and (b) develop expertise in regulating their own learning.

While research offers frameworks to help instructors guide students in mastering a body of knowledge, the literature offers little assistance to instructors who are interested in teaching students how to self-regulate their own learning. For example, Meece (1994) points out that research studies offer conflicting evidence on this topic; some show that certain instructional techniques can help students learn to self-regulate their learning, others show that these techniques hinder such learning. Similarly, Kluger and DiNisi (1996) found that in about two-thirds of the studies included in their meta-analysis, instructor feedback augmented performance, while in the remaining one-third of the studies instructor feedback attenuated performance. As a first step in assisting instructors faced with such conflicting research, this study addressed the question: What instructional techniques are most effective in helping students to learn how to self-regulate their learning?

Self-Regulated Learning (SRL)

Self-regulated learning refers to "the degree that individuals are metacognitively, motivationally, and behaviorally active participants in their own learning process"

(Zimmerman, 1994, p. 3). Self-regulation involves internal adjustments in personal reference standards for the purpose of utilizing new information effectively and efficiently (Carver & Scheier, 1990, 1991; Mithaug, 1993). These corrective adjustments emerge from a self-evaluation process in which individuals use reference standards (e.g., values, beliefs, goals) to monitor experiences for discrepancies between expectancies and actual events (Carver & Scheier, 1991; Borkowski & Thorpe, 1994; Higgins, 1989; Mithaug, 1993). While experiencing events that do not match their expectations can be unsettling, individuals oftentimes benefit from such experiences. As they attempt to make sense of experiences that do not match their expectations, individuals typically broaden their set of internal reference standards. Such broadening of scope usually brings an increased level of cognitive complexity to their thought. This expanded complexity of thought, in turn, can enhance their self-regulation in future situations (Baumeister & Newman, 1994; Carver & Scheier, 1991).

As outlined in Figure 1 (Travers, 1999) the process by which personal standards are evaluated, monitored, and adjusted involves interrelationships (Zimmerman, 1998) among personal reference standards (Higgins, 1989), perceiving personal choice (Bandura & Wood, 1989; Corno, 1994), feedback seeking (Butler & Winne, 1995), internal calibration (Howard-Rose & Winne, 1993; Shaw, 1994, 1998), and social interactions within the environment (Bandura & Wood, 1989; Bordin, 1994; McCombs, 1994).

Insert Figure 1 here.

Instruction that Enhances Self-Regulated Learning

Researchers report strategies that help students learn how to self-regulate their learning including message framing (Tykocinski, Higgins, & Chaiken, 1994), cues (Lysakowski & Walberg, 1982), types of feedback (Klugar & DeNisi, 1996), teacher-

student alliance (Kivlighan & Schmitz, 1992) and focus (Kokotovic & Tracey, 1990). When instructors use these and other interventions effectively, the results can explain about 27% of the variance associated with students' increased abilities to self-regulate their learning (Ertmer, Newby, & MacDougall, 1996). The research does not, however, clearly identify which practices in which combination and in which contexts are most effective.

Many studies that have attempted to address this issue (e.g., Gargallo, 1993) targeted specific self-regulatory skills, while other intervention studies (e.g., Ertmer, Newby & MacDougall, 1996) studied general self-regulation trends. Overall, those studies that examined instructional techniques that focused on helping students to use multiple self-regulatory learning skills tended to explain more variance (about 30-50%) than did studies that focused on teaching students single strategies.

In a review of research on this topic, Travers (1999) identified five common instructional practices among the studies that were most effective in helping students learn to self-regulate their learning. Instructors are most effective when they: (1) ***guide learners' self-beliefs, goal setting, and expectations*** (Klugar & DeNesi, 1996; Sarnat, 1997; Schwartz & Gredler, 1997); (2) ***promote reflective dialogue*** (Ertmer, Newby, & MacDougall, 1996; Garcia & Pintrich, 1992; Gargallo, 1993); (3) ***provide corrective feedback*** (Klugar & DeNesi, 1996; Trope & Neter, 1994; Vande Walle & Cummings, 1997); (4) ***help learners make connections between abstract concepts*** (Ertmer, Newby, & MacDougall, 1996; Hattie, Briggs, & Purdie, 1996; Low, Over, Doolan, & Michell, 1997); and (5) ***help students link new experiences to prior learning*** (Beauchamp, Halliwell, Fourneir, & Koestner, 1996; Ertmer, Newby, & MacDougall, 1996).

Effective instructors guide self-images, goal setting, and expectations.

Research (e.g., Kluger & DeNisi, 1996) indicated that effective instructors structure interventions that guide students' self-images, goal setting, and expectations. For example, when instructors helped students to frame new information or feedback in a positive versus negative manner (e.g., "managing an inventory in this manner will help you run a business successfully" versus "if you don't follow this procedure your business will fail"), students used the positively framed concept more frequently to regulate their own learning (Bargh, Lombardi, & Higgins, 1988; Tykocinski, Higgins, & Chaiken, 1994). Lysakowski and Walberg (1982) found that when instructors provided specific cues for using self-regulatory strategies, these cues explained 38% of the variance in post-test gains. Instructional methods (e.g., Butler, 1993; Schwartz & Gredler, 1997) that focused on helping students focus on goal achievement showed large effects (27% - 44% variance explained). Woffard, Goodwin, and Premack's (1992) meta-analysis on goal commitment clearly indicated that goal-setting strongly impacted learning (about 30% variance explained across studies).

Research from the teacher-student alliance literature (e.g., Summerville, 2000) also supported strong effects of message framing. When sessions were more challenging (Kivlighan & Schmitz, 1992) and student-centered (Bachelor, 1995) the alliance strengthened and behavioral outcomes were reached. Kivlighan and Shaughnessy (1995) and Al-Darmaki and Kivlighan (1993) found that as alliances developed over time, common perceptions and congruency of expectations also developed.

On the other hand, Kluger and DeNisi (1996) showed through their meta-analysis that when instruction threatened self-esteem, performance went down. Reference

standards were found to be only moderately stable (avg. 17% variance explained) and could be easily changed (Strauman, 1996), while negative self-constructs tended to be more durable (avg. 44% variance explained; Malle & Horowitz, 1995). In other words, instructional methods that focused the students on negative aspects of their learning decreased students' performance. Since reference standards are malleable (Tykocinski, Higgins, & Chaiken, 1994), however, instructional methods that guided reference standards toward self-regulation were more productive in helping students learn how to self-regulate their learning.

Effective instructors promote reflective dialogue

Gargallo's (1993) study on reflectivity training exemplifies the large effect that modeling and providing reflective dialogue have on internal calibration processes. In this study students engaged in instructional activities that included teachers modeling reflective practices and students using reflective dialogue to learn their lessons. After a three month training program, students from the treatment group were compared to a comparison group. Compared to the comparison group, learners who learned reflective practices made fewer errors ($\underline{d}$ = .66) and engaged in more reflective practice ($\underline{d}$ = .81). Four months later the students were compared again and the reflective group made even fewer errors ($\underline{d}$ = .91) and still engaged in more reflectivity ($\underline{d}$ = .61).

Other studies also support the value of reflective dialogue within the learning environment. Taylor and O'Reilly (1997) showed that after instructors modeled and reflected on covert self-rules for shopping with mildly retarded adults, the adults incorporated the rules and could shop independently. Ertmer, Newby, and MacDoughall (1996) trained groups of veterinarian students to use group discussions to think through

cases that involved high levels of ambiguity. In comparison to a comparison group, the groups trained in discussion improved the most in goal orientation, evaluation, and self-awareness (avg. 27% variance explained).

Garcia and Pintrich (1992) showed that reflective dialogue contributed to the development of a broad range of self-regulation skills. In comparison to students in a course taught in a traditional manner, students in a course that involved a high level of collaborative learning projects had better self-regulation strategies such as a higher goal orientation, better rehearsal strategies, higher elaboration of ideas, and better internal calibration when making decisions. In other words, the more reflective dialogue students engaged in, the more SRL strategies they developed.

Effective instructors provide corrective feedback.

Kluger and DeNisi's (1996) meta-analysis found that feedback which augmented performance included showing the right answers (15% variance explained) and showing progress (19% variance explained). Lysakowski and Walberg's (1982) meta-analysis found corrective feedback explained 32% of the variance on post-test gains. Bandura and Wood (1989) found that feedback on performance standards was critical in the decision-making process of business management students as they managed a simulated company. When the standards were given and perceived as attainable, the students felt they could control the situation and make appropriate business decisions (22% variance explained). Self-efficacy also increased when the performance standards were clear and perceived to be attainable (11% variance explained). These results demonstrate that instructors who provide corrective feedback effectively set clear and obtainable standards and thereby help students develop reference standards they can use to self-regulate their learning.

When students experience feedback as discouraging or threatening to their self-esteem, their performance is attenuated (Kluger & DeNisi, 1996). Surprisingly, Kluger and DeNisi also found that offering praise often attenuated performance. Kluger and DeNisi (1996) suggest that when feedback (positive or negative) is experienced as a statement about the learner (and not about the task of learning) a learner's attention is diverted away from learning to issues related to self-esteem and self-efficacy. Travers (1999) found that such feedback tended to focus a learner's attention on a teacher's reference standards and not on the learner's. Such diversions tend to lessen self-regulation.

Trope and Neter (1994) in their study of accepting positive and negative feedback found that when students had positive (helpful) past feedback experiences, they were more accepting of negative (corrective) feedback than students who did not have experiences with receiving positive feedback (50% variance explained). When asked for preferences of receiving positive or corrective feedback, these students who received positive feedback were more interested in corrective feedback than positive feedback than were their counterparts (61% variance explained as compared to 18%, respectively). Vande Walle and Cummings (1997) found that when the feedback was an avenue for attaining learning goals the value of feedback was more important than its psychological "cost" (37% variance explained). In short, perhaps because it assisted them in self-regulating their learning, students reported corrective feedback to be essential in assisting them to achieve their learning goals.

Effective instructors help students make connections between abstract concepts.

In studies using techniques designed to help students make connections among abstract concepts (e.g., Ertmer, Newby, & MacDougall, 1996) medium to large effects were found in increasing students' SRL. For example, Perciful and Nester (1996) taught clinical trials with nursing students using an application and integration model that focused on making connections among abstract concepts covered in the course. They found a variety of SRL skills (assessing, evaluating, planning, etc.) improved over the semester as compared to the comparison group (avg. 17% variance explained).

Since putting in a game of golf requires considerable control over cognition and emotion, Beauchamp et al., (1996) hypothesized that direct training in self-regulation would improve putting performance. The treatment group was trained to link together cognitive and emotional strategies for putting in various types of situations. The comparison group received no such specific training. Over one semester, the performance of the treatment group improved more than that of the comparison group ($F_{(1,177)} = 68.21$, $p<.001$; 28% variance explained).

Ertmer, Newby, and MacDougall (1996) found that when instructors used case-based instruction in a way that helped students learn to separate relevant from irrelevant information, the SRL skills of goal orientation ($d = .80$), evaluation ($d = .94$), self-awareness ($d = .64$), and openness to challenges ($d = .31$) increased. In addition, contextual vulnerability (information in the cases that limited motivation) decreased ($d = .36$). Low, et al., (1997) instructed students on how to read algebraic word problems in mathematics (e.g., how to assess relevant information). In their treatment group high SRL students increased in utilizing relevant material ($d = .95$) while the low SRL students increased in merely distinguishing irrelevant information ($d = 1.44$). Although these

studies also support differences between high and low SRL, they indicate that instructional practices that guide abstract ideas (e.g., separating relevant from irrelevant information) help students know where to and how to focus their attention.

Effective instructors link new experiences to prior learning.

The studies that provided opportunities for students to connect their new learning to prior experiences resulted in large effects on the development of SRL. Beauchamp's et al., (1996) study of golfers is a good example. Each putting experience was completely new and the students were trained to connect past experiences with the current one. The students' putting performance improved, explaining 28% of the variance when compared to the comparison group. Ertmer, Newby, and MacDougall's (1996) case-studies were based on real situations that veterinarians would encounter. The students worked with each case connecting it to what they knew and what could be possible. Many of the students expressed, in interviews throughout the study, a change in the way they approached their learning. They found themselves becoming less interested in having to know the answer and more interested in looking at the situation from a broader context.

The nursing students in Perciful and Nester's (1996) study applied their classroom learning in clinical experiences. The study followed a model whereby students applied their learning to new experiences and then returned to the classroom to integrate the experiences with classroom information. Sternberg, Wagner, and Okagaki (1993), in a review of their own work, concluded that experience provides learners with opportunities to develop tacit knowledge that enhances self-management.

Effective instructors use a combination of methods

Overall, studies that used combinations of instructional techniques (e.g., Ertmer, Newby, & MacDougall, 1996) tended to be most effective in enhancing SRL perhaps because many inter-related processes must occur for students to self-regulate their learning (Shaw, 1998). How then can instructors combine these practices to best enhance the development of SRL?

The purpose of this study was to investigate the relationship between different instructional designs and changes in students' self-regulated learning. Specifically, the study compared gains in self-regulation for two groups of learners. Instructors of the students in the treatment group used combinations of the five instructional methods outlined in this section of the paper. Instructors of students in the comparison group used a traditional lecture format.

Methods and Procedures

Sample

This study took place within a New England community college that had a total of twelve sites throughout the state. The sample consisted of 139 volunteer adult math students (M = 31.7 years) who were identified, through an initial math assessment, as having low math skills. Students were enrolled either in a basic mathematics, basic algebra, or general concepts of mathematics course. At the end of the semester 78 students (M = 32.2 years) remained in the study (56% for each group); of these, 24 were in the treatment group and 54 were in the comparison group. All analyses were conducted using these 78 participants.

Instructional group selection was based on whether the instructors had completed training on how to integrate within their lessons the five strategies for enhancing SRL skills (i.e., guiding students' self-beliefs, goals, and expectations; using reflective dialogue;

providing corrective feedback focused toward achieving the instructional goals; connecting abstract concepts to the activities; and linking new experiences to prior learning). The instructors who taught the comparison group did not receive any training and were identified through an instructor survey as ones who primarily used a lecture format as their instructional method.

Instrumentation

Data were collected using the Approaches to Learning Questionnaire (ALQ) (Travers, 1999). The ALQ was developed and pilot tested by the researchers to measure the degree to which students self-regulated their learning. Pre-semester and a post-semester versions of the ALQ were used for the study. The pre-semester questionnaire consisted of a demographic section and 68 self-regulation items using a 5-point Likert measurement format (i.e., 1=strongly disagree; 5=strongly agree) to measure the degree that students perceived the statement represented a characteristic of themselves as a learner. The teacher-student alliance scale (i.e., mutual goals, tasks, and bond) was included in the post-semester questionnaire since prior research (e.g., Horvath, 1994a, 1994b) indicated that the alliance would not be formed until the 3rd to 5th class meeting. The post-semester version also included a section that asked students to indicate the percent of time devoted in class to lectures, going over homework, group activities, practicing problems in class, and using application problems and to rank the usefulness of each for learning math on a 5-point Likert measurement format (i.e., 1=unhelpful; 5=extremely helpful).

Confirmatory factor analyses (CFA) using SPSSx-LISREL Maximum Likelihood procedures (Gable & Wolf, 1993; Kline, 1998) and Fit Indices (i.e., Bentler Bonnet Index, Tucker Lewis Index, and Comparative Fit Index) were used to examine the

construct validity of the pre-semester questionnaire and the comparison and treatment post-semester questionnaire on each of the seven self-regulatory variables (Travers, 1999). Items were retained for analyses based on loadings above .30 (Kenny, personal conversation) and scales were developed. Cronbach's alpha internal reliabilities procedures were performed on the scales created from the factor structures. The resulting scales, Reference Standards (Actual, Ideal, and Ought Self), Feedback Seeking, Internal Calibration, Perceiving Choice, and Effective Learning Behaviors, ranged from six to ten items each. All alpha internal reliabilities fell within the .70 to .90 range recommended for surveys of this type (Gable & Wolf, 1993). The revised self-regulated learning scales were then used for all analyses.

Results

When analysis of variance (ANOVA) procedures (Tabachnick & Fidell, 1996) were used to examine the extent to which the treatment group differed from the comparison group with respect to the self-regulation measures at the end of the semester, no significant differences were found. In addition, no significant differences were found when descriptive statistics (Cohen's d) and paired t-tests were used at an item level. Overall these analyses indicated that group membership (treatment versus comparison) explained only small amounts of variance in the extent to which students learned to regulate their learning (1% - 5% variance explained).

When correlation matrices were examined for the treatment and comparison groups, significant correlations were found among the self-regulation variables for both groups. For most variables, the treatment group had larger correlations than did the comparison group indicating higher relationships among the self-regulation variables.

Some correlations (e.g., feedback seeking and internal calibration) were significant for one group and not for the other (see Table 1).

Insert Table 1 here.

Differences between correlation coefficients were explored through Fisher z-transformations (Cohen, 1988). Each correlation was converted to a z-transformation (Kleinbaum, Kupper, & Muller, 1988; Shavelson, 1996) and q (the effect size of the difference) was calculated by finding the difference between the z-transformations (Cohen, 1988). Medium to large differences between groups (Cohen, 1988) were found, mainly among feedback seeking and internal calibration. These results indicated that for the treatment group the self-regulation variables were more related than for the comparison group.

To explore further the differences in patterns of self-regulation, path analyses were computed for the pre-semester data and the treatment and control post-semester data measures to determine how the groups differed in self-regulation from pre-to-post semester. Path models were developed based on the theoretical model for self-regulated learning presented in Figure 1. The paths were tested using standard multiple regression procedures (e.g., Klein, 1998) whereby the designated paths were entered first as a block, and the undesignated paths second; models were trimmed based on significant paths.

The results indicated that initially the two groups were the same, but after one semester the comparison group's self-regulation variables had become less related. Specifically, for the comparison group (traditional lecture) the relationship with the teacher became critical in the self-regulation path model (about 30% variance explained), perceiving choice within the learning context dropped out of the model, and there was a

decrease in the relationship between feedback seeking behaviors and internal calibration of new material (13% of the variance decreased to 4% of the variance explained). Overall, the comparison group's paths in the model for SRL had become less connected. Figure 2 illustrates the resulting comparison group's path analysis.

Insert Figure 2 here.

In contrast, for the treatment group the self-regulated learning variables developed tightly woven paths that were highly related leading to effective learning behaviors (average 42% variance explained across the model). The model had shifted to internal calibration of new material being critical to explaining effective learning behaviors (66% of the variance explained). Figure 3 illustrates the path analysis for the ~~comparison~~ treatment group. These results indicated that students in courses taught by instructors who used the five principles for enhancing self-regulated learning became more self-regulated in the ways that they approached their learning. In contrast, students taught by traditional lecture format became more teacher-regulated in the ways that they approached their learning.

Insert Figure 3 here.

DISCUSSION

The teaching methods used by the treatment group embedded the teaching of self-regulated learning into the context of each course. By focusing students on regulating their own learning, instructors in the treatment group provided cues and feedback that helped students learn to self-regulate their learning. Overall the results demonstrate that teachers who use the strategies outlined in this paper can help students learn to regulate their learning. The results also suggest that:

- Instructors can provide salient cues in the classroom setting that can help students to develop reference standards they can use to regulate their learning.
- When instructors encourage students to exercise choices about how to accomplish learning activities, learners shift the focus of their regulation away from the teacher and onto salient cues in the learning task.
- When students are encouraged to seek feedback they experience opportunities for obtaining additional information and for exercising choices regarding how to solve problems.
- When teachers encourage self-regulated learning, learners adjust their internal calibration of reference standards to search for cues provided in the learning task, monitor the effectiveness of their learning behaviors, and evaluate the effectiveness of their learning.

An instructor who enhances learner's self-regulation provides cues that are "salient" because they guide students' reference standards toward monitoring the effectiveness of the strategies the student is using to learn By asking probing questions, providing new experiences, setting up ill-defined problems for students to solve, and providing opportunities for students to engage in reflective dialogue about possible solutions to the problems, instructors can help students shift the reference standards they use to monitor their learning toward the content to be learned and away from the teacher. Figure 4 maps the relationships between the instructor, instructional methods, and the students' self-regulated learning processes.

Insert Figure 4 here.

Figure 4 outlines the important relationship between teaching methods and students' regulation of their learning. As indicated by the model, instructors play a critical role in the SRL process by providing cues within the instructional setting that students can use to learn how to regulate their own learning. The results of this study suggest that students align their reference standards to the cues that they are provided by instructors. This result has important implications for higher education. It suggests that

instruction in collegiate classrooms is limited when it has a unitary focus on students learning a body of knowledge. The results suggest a much broader focus for college instruction. Instead of focusing on the delivery of content, the results suggest that higher education use content as a means to help students learn to self-regulate their own learning. While this is an often-stated goal of higher education, it is one that is not usually pursued actively. Hopefully the results of this study will provide some guidance for instructors who are committed to helping students learn to regulate their own learning.

This study also raises questions about measuring SRL. The theoretical model used to guide this study was not founded on assumptions of independence among variables. Instead, the theoretical model proposed that all variables involved in SRL are interrelated. This perspective explains why ANOVA missed the set of relationships among the self-regulation variables. Standard univariate or ANOVA methods are not designed to pick up inter-relationships among variables. Future research in self-regulation needs to focus on examining appropriate ways in which to capture these dynamic relationships within the context of the learning environment.

The problem of how higher education can assist students to develop self-regulated learning skills is complex and challenging. Heber (1999) argued, at a recent conference for the American Association for Community Colleges (AACC), that college administrators need to find ways to help college students acquire the skills they need to achieve employability. The results of this study have promise for helping colleges achieve this goal. Through the use of the instructional techniques outlined in this paper, college educators can help students improve their self-regulation, a skill that is intimately related to employability.

This study indicated that teaching methodologies can help students learn to self-regulate their learning. Specifically, the results of this study suggested that students who learn through lecture-based teaching formats become more *other-regulated.* These students become focused on the teacher as the central source of salient information to solve problems. This dynamic has potential spillover onto the work environment. If students leave higher education expecting another person, a boss, to be the central source of salient information, they will not be effective at independently solving problems.

On the other hand, students who learned through teaching methods that embedded learning self-regulated learning skills within the curriculum became more effective in regulating their learning. If students were to learn how to become more self-regulated throughout college, then colleges would graduate into the workforce adults who are better able to solve problems themselves. Since problems in the work world are complex and abstract, adults need skills that will enable them to solve problems effectively.

This research has also indicated that self-regulation is an integrated learning process. Future research in self-regulated learning must focus on methods that can capture the inter-relationships among the self-regulation variables. Past research has focused on the separate pieces, and perhaps has not captured the relational aspects of self-regulated learning. By using an integrated model of self-regulated learning, this study was able to depict shifts in the way students learned to regulate their learning over the course of the semester. Additional studies are needed to explore these implications.

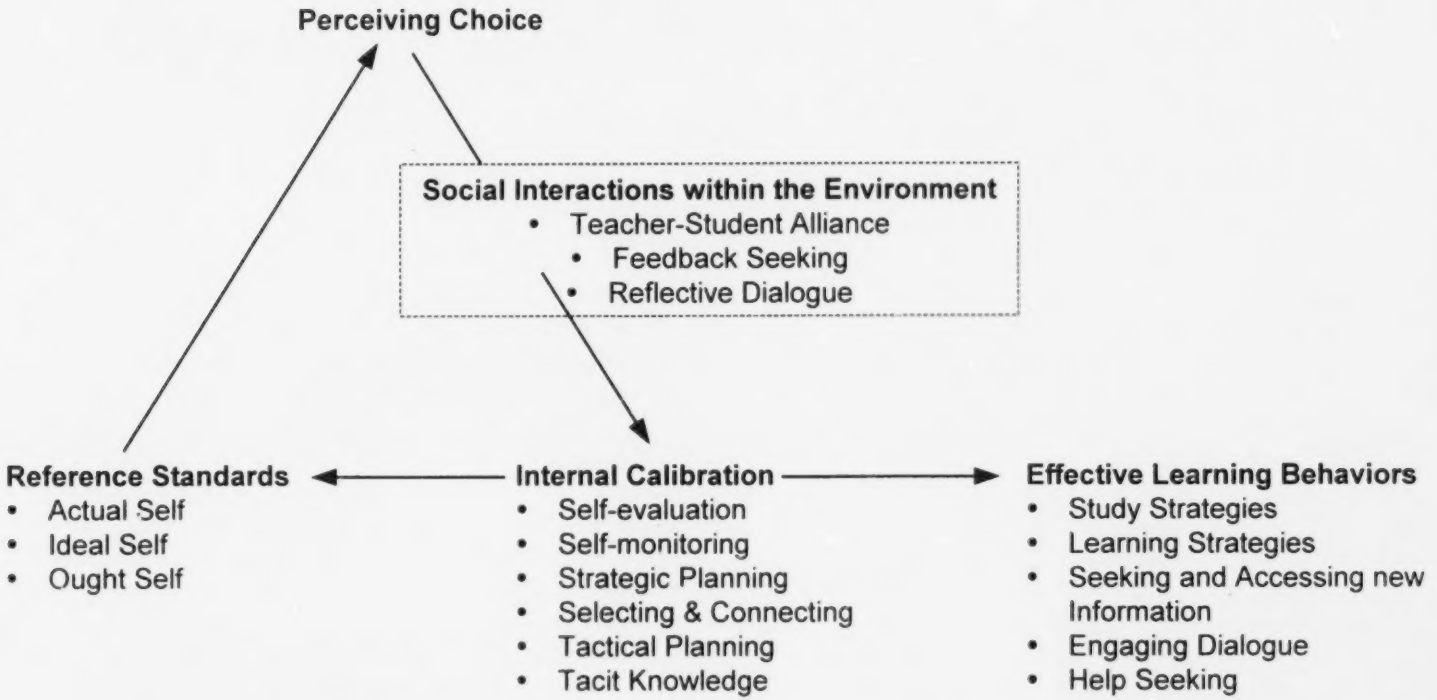


Figure 1: Theoretical Model of the Inter-relationships within Self-Regulated Learning

Table 1: Inter-Correlations among Self-Regulated Learning Variables

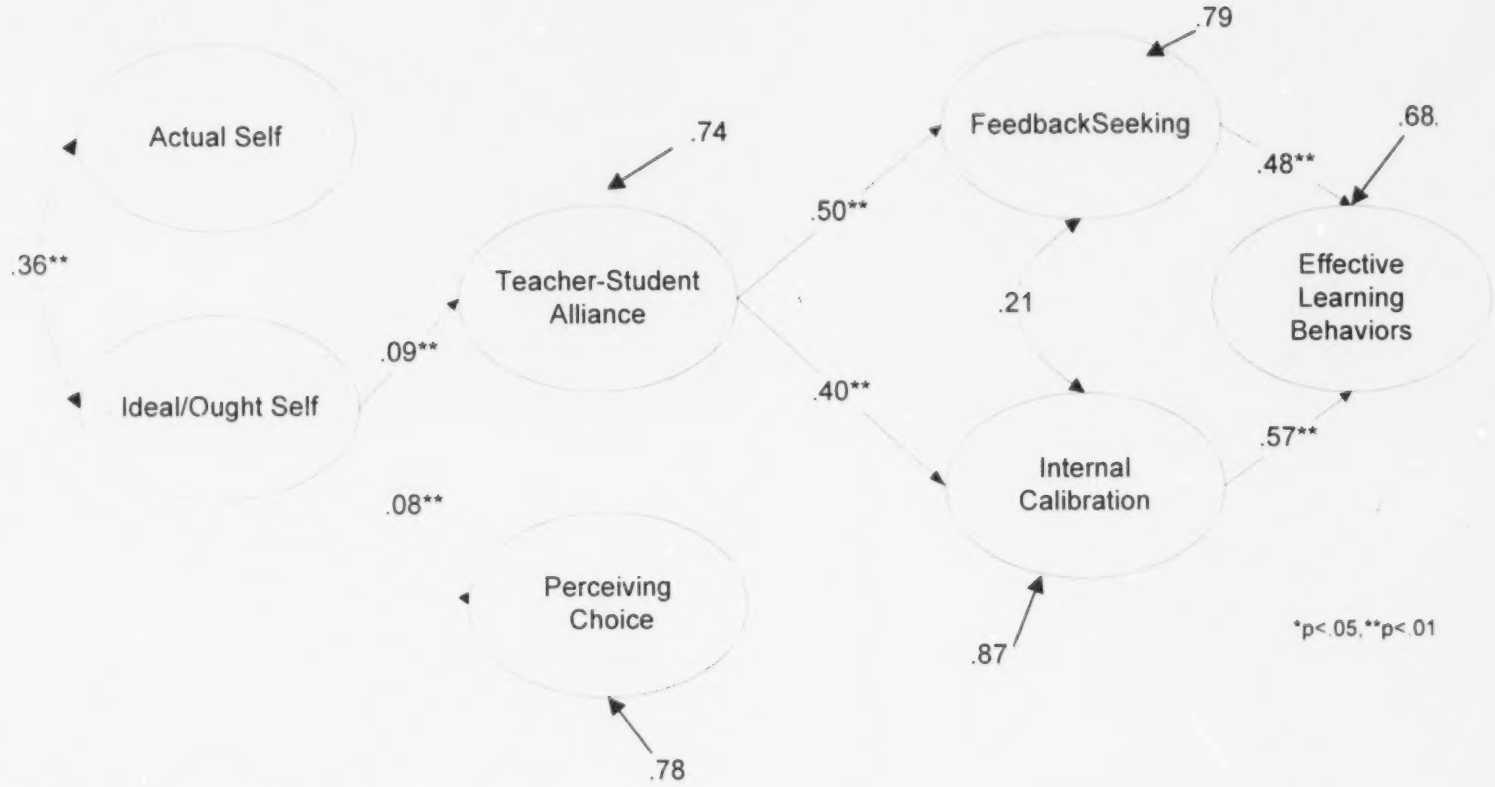
Treatment Group Inter-Correlations for Variables (n=24)

	1.	2.	3.	4.	5.	6.	7.
1. Actual							
2. Ideal	.20						
3. Ought	-.03	.82**					
4. Teacher-Student Alliance	-.01	.69**	.70**				
5. Feedback Seeking	-.07	.59**	.63**	.72**			
6. Internal Calibration	.39	.57**	.61**	.53**	.61**		
7. Perceiving Choice	.04	.66**	.71**	.65**	.86**	.69**	
8. Effective Learning Behaviors	.12	.48**	.53**	.52*	.69**	.81**	.76**

Comparison Group Inter-Correlations for Variables (n=54)

	1.	2.	3.	4.	5.	6.	7.
1. Actual							
2. Ideal	.26						
3. Ought	.42**	.78**					
4. Teacher-Student Alliance	.24	.68**	.58**				
5. Feedback Seeking	-.05	50**	.33*	.60**			
6. Internal Calibration	.28*	.52**	.37*	.49**	.21		
7. Perceiving Choice	.23	.71**	.74**	.54**	.49**	.36**	
8. Effective Learning Behaviors	.29*	.66**	.54**	.61**	.52**	.60**	.60**

*p < .05, ** p < .01



Fiqure 2: Model of Self-Regulated Learning
Post-semester Comparison Group (n=54)

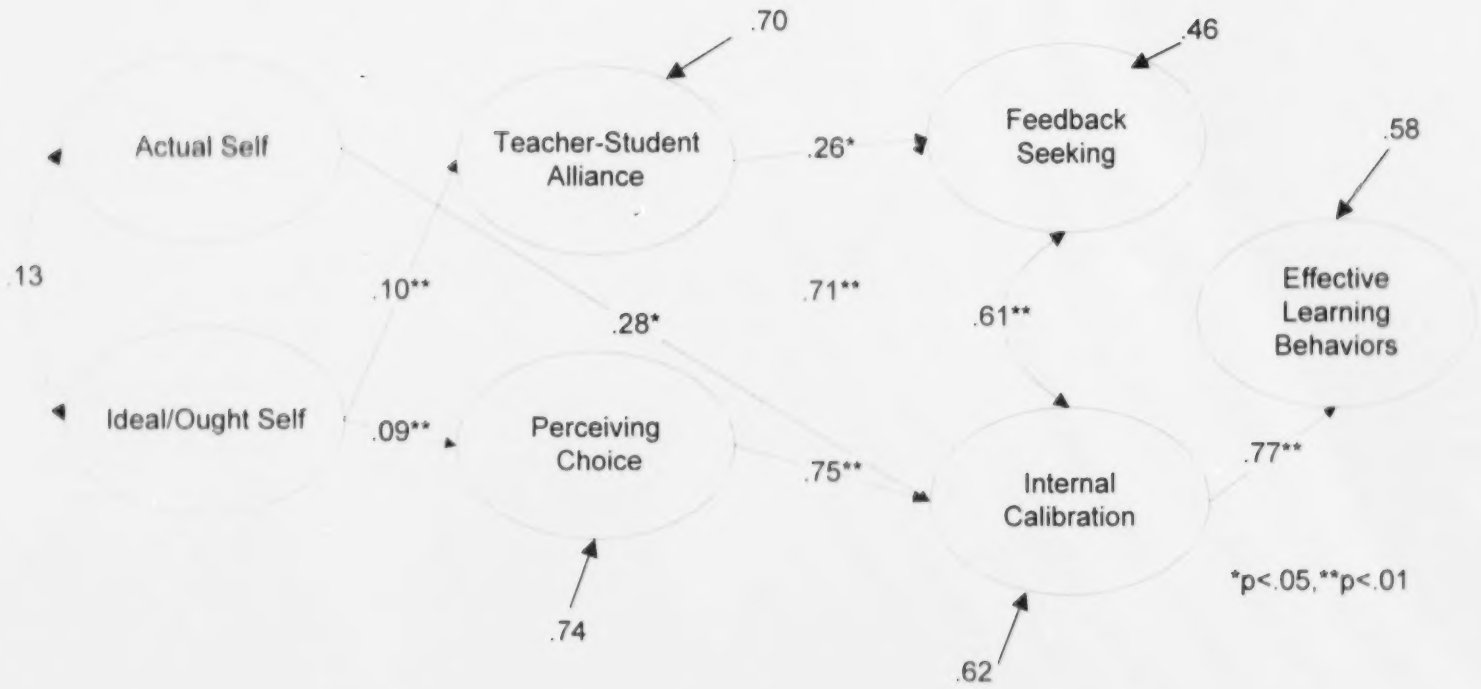


Figure 3: Model of Self-Regulated Learning
Post-semester Treatment Group (n=24)

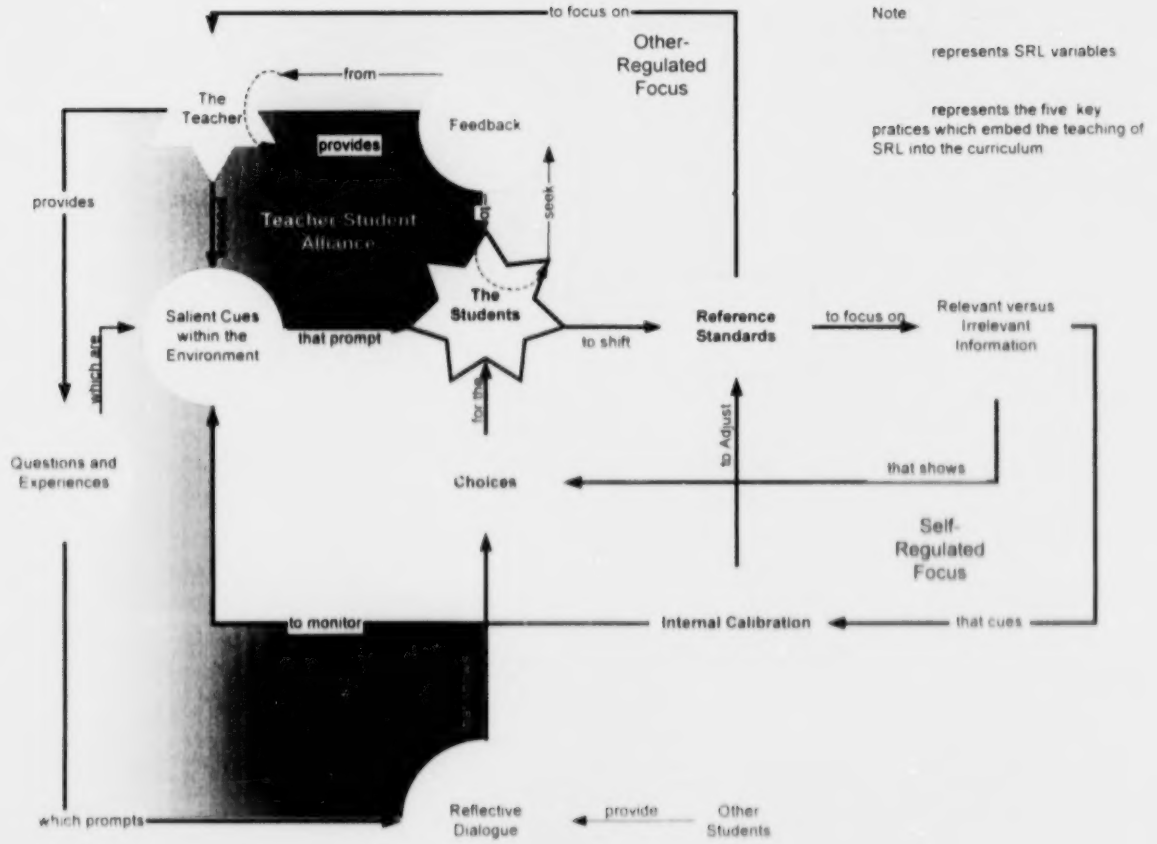


Figure 4: Theoretical Model of How Instructional Practices Impact Students' Self-Regulated Learning

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